

What is claimed is:

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1. An implantable drug infusion device comprising:
 - a hermetic enclosure;
 - a fluid reservoir positioned within the hermetic enclosure, the fluid reservoir having means for maintaining the fluid therein within a first pressure and a second pressure; the fluid reservoir having an fluid outlet port;
 - means for delivering a fluid into a patient's body; and
 - a flow regulator coupled to the fluid outlet port, the flow regulator coupled to the means for delivering a fluid into a patient's body the flow regulator having a fluid pathway between the fluid outlet port and the means for delivering a fluid into a patient's body, the flow regulator further having means for permitting fluid to flow within the fluid pathway when the fluid in the reservoir is at a pressure which is more than the first pressure and less than the second pressure.
2. An implantable drug infusion device according to claim 1 wherein the flow regulator comprises a membrane, a shoulder and a bottom layer, the membrane having a hole, whereby the fluid pathway is defined from above the membrane, through the hole and along the bottom layer, whereby flow through the hole causes the membrane to deflect and engage the bottom layer thereby impeding the fluid pathway.

3. An implantable drug infusion device according to claim 2 further comprising a membrane deflected by fluid flow within the fluid pathway.
3. An implantable drug infusion device according to claim 2 further comprising the membrane cantilevered from the shoulder over the bottom layer,
4. An implantable drug infusion device according to claim 3 further comprising means for determining any deflection in the membrane.
5. An implantable drug infusion device according to claim 4 wherein the membrane further includes means for sensing the deflection of the membrane.
6. An implantable drug infusion device according to claim 5 means for calibrating the sensed deflection of the membrane with the rate of fluid flow through the fluid pathway.
7. An implantable drug infusion device according to claim 1 wherein the flow regulator comprises a membrane, a shoulder and a bottom layer, the bottom layer having a channel therein, the membrane cantilevered from the shoulder over the bottom layer, the membrane having a hole, whereby the fluid pathway is defined

from above the membrane, through the hole and along the bottom layer, whereby flow through the hole causes the membrane to deflect and engage the bottom layer thereby permitting the fluid pathway to only exist within the channel.

8. An implantable drug infusion device according to claim 1 further comprising means for varying the length of the flow channel.

9. An implantable drug infusion device comprising:

a hermetic enclosure;

a fluid reservoir positioned within the hermetic enclosure, the fluid reservoir having an fluid outlet port;

means for delivering a fluid into a patient's body; and

a flow regulator coupled to the fluid outlet port, the flow regulator coupled to the means for delivering a fluid into a patient's body the flow regulator having a fluid pathway between the fluid outlet port and the means for delivering a fluid into a patient's body, the flow regulator having a membrane, a shoulder and a bottom layer, the membrane cantilevered from the shoulder over the bottom layer, the membrane having a hole, whereby the fluid pathway is defined from above the membrane, through the hole and along the bottom layer, whereby flow through the hole causes the membrane to deflect and engage the bottom layer thereby impeding the fluid pathway.

10.. An implantable drug infusion device according to claim 9 wherein the bottom layer having a channel therein, whereby flow through the hole causes the membrane to deflect and engage the bottom layer thereby permitting the fluid pathway to only exist within the channel.

11. An implantable drug infusion device according to claim 10 wherein the membrane further includes means for sensing the deflection of the membrane.

12. An implantable drug infusion device according to claim 11 means for calibrating the sensed deflection of the membrane with the rate of fluid flow through the fluid pathway.

13. An implantable drug infusion device according to claim 9 wherein the flow regulator comprises a membrane, a shoulder and a bottom layer, the bottom layer having a channel therein, the membrane having a hole, whereby the fluid pathway is defined from above the membrane, through the hole and along the bottom layer, whereby flow through the hole causes the membrane to deflect and engage the bottom layer thereby permitting the fluid pathway to only exist within the channel.

14. An implantable drug infusion device according to claim 9 further comprising means for varying the length of the flow channel.

15. An implantable drug infusion device comprising:

a hermetic enclosure;

a fluid reservoir positioned within the hermetic enclosure, the fluid reservoir having means for maintaining the fluid therein within a first pressure and a second pressure; the fluid reservoir having an fluid outlet port;

means for delivering a fluid into a patient's body;

a flow regulator coupled to the fluid outlet port, the flow regulator coupled to the means for delivering a fluid into a patient's body the flow regulator having a fluid pathway between the fluid outlet port and the means for delivering a fluid into a patient's body, the flow regulator further having means for permitting fluid to flow within the fluid pathway when the fluid in the reservoir is at a pressure which is more than the first pressure and less than the second pressure; and

means for sensing the rate of fluid flow through the flow regulator:

16. An implantable drug infusion device according to claim 15 wherein the means for sensing the rate of fluid flow through the flow regulator: comprises a membrane deflected by fluid flow within the fluid pathway.

17. An implantable drug infusion device according to claim 16 further comprising means for determining any deflection in the membrane.

18. An implantable drug infusion device according to claim 17 further comprising means for calibrating any deflection in the membrane against a predetermined fluid pressure in the reservoir.

19. An implantable drug infusion device comprising
a hermetic enclosure;
a fluid reservoir positioned within the hermetic enclosure, the fluid reservoir having means for maintaining the fluid therein within a first pressure and a second pressure; the fluid reservoir having an fluid outlet port;
means for delivering a fluid into a patient's body;
a flow regulator coupled to the fluid outlet port, the flow regulator coupled to the means for delivering a fluid into a patient's body the flow regulator having a fluid pathway between the fluid outlet port and the means for delivering a fluid into a patient's body, the flow regulator further having means for permitting fluid to flow within the fluid pathway when the fluid in the reservoir is at a pressure which is more than the first pressure and less than the second pressure; and
means for sensing the flow through the flow regulator.

20. An implantable drug infusion device according to claim 19 further comprising means for calibrating the means for sensing the flow through the flow regulator.

21. An implantable drug infusion device according to claim 20 wherein the means for sensing comprise a deflectable membrane, the membrane have one or more elements indicating membrane deflection.

22. An implantable drug infusion device according to claim 21 further comprising means apply a first amount of energy is applied across one or more elements; means for sensing a parameter indicated through the first amount of energy applied across one or more elements

means for generating a known pressure in the reservoir

means for applying a second amount of energy across one or more elements while a know pressure is generated in the reservoir

means for sensing a second parameter indicated through the second amount of energy;

means for calibrating sensed second parameter against the preceding known pressure and determine quantity of membrane deflection

23. An implantable drug infusion device according to claim 19 further comprising means for determining any deflection in the membrane caused by a pressure to the

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IMPLANTABLE DRUG INFUSION DEVICE
HAVING A FLOW REGULATOR

fluid in the reservoir and adjusting the determined deflection to compensate for any changes in the membrane shape to thereby provide a measure of fluid flow through the flow regulator.